Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	GN Docket No. 17-183
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	
	)	
Notice of Inquiry	)	

COMMENTS OF
CISCO SYSTEMS, INC.

Cisco Systems, Inc. (Cisco) supports the Commission's decision to open a docket on mid-band spectrum for flexible wireless broadband use.[1] Cisco has joined the Mid-Band Spectrum Coalition[2] in its comments and a second coalition of unlicensed interests in separate

[1] In the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, GN Docket No. 17-183, Notice of Inquiry, released August 3, 2017.

[2] The Mid-Band Coalition is: CTIA, ITI, Wi-Fi Alliance, Apple, Broadcom, Cisco, Comsearch, Ericsson, Hewlett-Packard Enterprise, Intel, Google and Alphabet Access, Nokia, Samsung, T-Mobile, and Verizon.

comments.[3] In this submission, Cisco writes only to make a few additional points concerning the proposal to introduce unlicensed into the 6 GHz band.[4]

Engineering analysis is the threshold requirement for opening 6 GHz

Because 5.925-7.125 GHz is populated with licensed incumbents, the first step in considering whether to open the band to unlicensed transmitters is to determine the incumbent emissions environment, and project how new transmitters could be introduced without harming those with superior spectrum rights. That engineering analysis and modeling must come first in order engage the core of the debate. When dealing with such a large piece of spectrum as is proposed here, with diverse incumbents, and working in a context of large groups of companies to present common views, it is no surprise that such analysis and recommendations take time to produce. To be clear, Cisco – and the proponents of adding unlicensed transmitters to the 6 GHz band generally - recognize our obligations to step forward with such analysis and recommendations. Specifically, stakeholders (co-channel and adjacent channel) must have a meaningful opportunity to review and comment on that analysis and the recommendations in order to inform the Commission's thinking.

[3] This coalition consists of: All Points Broadband, Amplex Internet, Apple, Blaze Broadband, Broadcom, Cambium Networks, Cisco Systems, Cypress Semiconductor, Dell, Extreme Networks, Facebook, Fire2Wire, Google, Hewlett-Packard Enterprise, HP, Intel, Joink, Mediatek, MetaLINK Techologies, Microsoft Corporation, New Wave Net, Pixius Communications, Qualcomm, Rise Broadband, Ruckus (a business unit of Brocade), Snappy Internet, Sony Electronics, Western Broadband, Wireless Internet Service Provider Association, WISPER ISP.

[4] Cisco supports examining 5.925-7.125 GHz for unlicensed use.

Until we get to that point – where the technical debate can be joined – then what we can accomplish in the record is more limited – e.g., to establish that there is interest on the part of those seeking access to the band, that the interest is substantial, that there is good reason to examine the band from both a demand and supply perspective to determine if more intensive use can be made of it, and that parties believe it is necessary to examine what conditions would be necessary to protect incumbents. The Commission has an array of procedural rulemaking tools at its disposal to ensure that technical analyses - once presented - can be subject to scrutiny, and we have no doubt that this can and will occur long before it decides to draft final rules.[5]

Licensed, lightly licensed, and unlicensed spectrum are needed for 5G success

One important point has not been made in other filings that Cisco has participated in – licensed and unlicensed (and lightly licensed, such as by a database) are often discussed as different, and sometimes competing, kingdoms. From a spectrum policy perspective, it can sometimes feel that way. But from a technology perspective, it is an entirely different matter. Cisco does not believe the competitive paradigm to be true today, and believes it will be even less true in the future. The technologies are not just complementary. Serious work has been and continues to be done to integrate them to enable seamless consumer experiences. The consequence for spectrum policy is this – licensed, unlicensed, and lightly licensed spectrum are all going to be needed to address users' demand in the 5G future.

[5] Cisco does not rule out testing during the course of this proceeding, although testing is probably best thought of in terms of testing mitigations to determine if they can meet Commission requirements.

Beyond the obvious point that there are now LTE-based unlicensed technologies that can take advantage of unlicensed spectrum, there is a universal view within industry that 5G will represent an amalgamation of licensed, lightly licensed and unlicensed networks more explicitly than ever before.[6] After all – why not leverage the enormous Wi-Fi infrastructure that is in place and growing? Moreover, Wi-Fi continues to serve an important function as a neutral host – enabling consumer connectivity regardless of wireless carrier affiliation. Today, unlicensed capability (and in particular Wi-Fi capability) embedded in consumer devices shoulders an enormous load of demand and is the wireless technology responsible for delivering more packets than any other.[7] These facts, among many others, make integration compelling. While there is work left to be done, industry has taken the first steps in standards to integrate unlicensed networks, both trusted and untrusted, with licensed, and continues to actively evaluate various approaches to further integrating Wi-Fi and 3GPP-based networks.[8]

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[6] In fact, the role of both unlicensed and licensed technologies in 5G has become a hot topic in industry white papers. *See* "5G Era (Interfaces and Evolution): The Role of Wi-Fi and Unlicensed Technologies in 5G Networks," Wireless Broadband Alliance (September 2017) at https://www.wballiance.com/resources/wba-white-papers/; "Alternative LTE Solutions in Unlicensed Spectrum: Overview of LWA, LTE-LAA and Beyond," Intel White Paper (2016) at https://www.intel.com/content/www/us/en/wireless-network/unlicensed-lte-solutions-paper.html; "Wireless Technology Evolution Towards 5G," 5G Americas (February 2017) at http://www.5gamericas.org/files/3214/8833/1313/3GPP_Rel_13_15_Final_to_Upload_2.28.17_AB.pdf.

[7] According to Cisco's 2017 Visual Networking Index, in the United States 51.5% of Internet data traffic traveling on fixed links will utilize Wi-Fi at the edge in 2021. For mobile networks, consumers are offloading a majority of traffic through their devices to Wi-Fi – 60% in 2016 to 70% in 2021.

[8] "5G Era (Interfaces and Evolution): The Role of Wi-Fi and Unlicensed Technologies in 5G Networks," Wireless Broadband Alliance (September 2017) at page 37, https://www.wballiance.com/resources/wba-white-papers/. The paper notes that industry has identified three basic approaches to integration: (1) access-centric that is part of 3GPP Release

Access to substantial bandwidth lies at the heart of the need for unlicensed spectrum

Indoor use cases and indoor demand continue to be the heaviest users of Wi-Fi technologies. That is not to say outdoor use should be disregarded – indeed, outdoor use is critical for smart city networks, rural broadband, in certain enterprises, and as an adjunct to cable networks, to name a few use cases. As a result, much more outdoor spectrum is needed for outdoor access points and point to point applications. Yet indoor access point traffic continues to predominate. For spectrum policy purposes, that means "megahertz" – access to bandwidth – is the fundamental goal, followed closely by "milliwatts." For example, outdoor use requires more power than indoor.

Part 15 should be the home of proposed 6 GHz rules

Cisco believes Part 15 should be the home of proposed rules for unlicensed operations in the 5.925 – 7.125 GHz range. To the extent mitigations are required, those can be established in Part 15 FCC rule and/or testing requirements as appropriate. Also, a Part 15 approach eases the problem of securing test labs as existing unlicensed test labs are accredited for Part 15.

13, with LTE Wi-Fi Aggregation (LWA) for integrating trusted Wi-Fi and LTE Wi-Fi Aggregation using IPSec Tunnel (LWIP) for integrating untrusted Wi-Fi networks (2) core-centric integration seen in 3GPP Release 8 to integrate untrusted Wi-Fi via an ePDG and in Release 11 for integrating trusted Wi-Fi into LTE's Evolved Packet Core (3) above-the-core integration techniques. The paper notes that today discussions typically also include aggregation capabilities – i.e., allowing a single device to have access to multiple physical layers at the same time. See also id. at page 6, noting that Release 15 provides for integration of untrusted non-3GPP networks.

Aeronautical Mobile Telemetry adds new issues

The NOI notes the existence of pending proceedings in other dockets where the spectrum at issue in this NOI is being considered for additional uses.[9] Cisco has not taken a position on those matters, including whether the FCC should or should not open the spectrum considered here to additional priority use. We note only that if the Commission wishes to proceed to an implementation of AMT in the 5.925-6.700 GHz band, then it will need to provide additional information about the AMT use of the band and specifically request comment at a future stage in this proceeding concerning the ability of unlicensed technologies to mitigate AMT from airplanes and rocket launches.

Respectfully submitted,

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[9] Notice of Inquiry at para. 11.